

## CLAIMS:

1. A device (1) for on-chip magnetic resonance measurements for use with a first orienting magnetic field, the device comprising a chip, said chip comprising,
  - on-chip means for creating a second electromagnetic field to excite precession of oriented spin magnetic moments (11) in a sample (9) to be analysed, and
  - 5 - at least one magnetic sensor (4) for on-chip detection of a magnetic precession of the spin magnetic moments (11) about the first orienting magnetic field in the sample (9) to be analysed.
2. A device (1) according to claim 1, wherein the magnetic sensor (4) is a  
10 magneto-resistance sensor.
3. A device (1) according to claim 1 or 2, the chip laying in a plane, wherein said on-chip means for creating a second electromagnetic field and said magnetic sensor (4) are positioned adjacent each other in the plane of the chip.  
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4. A device (1) according to claim 1 or 2, the chip laying in a plane, wherein the means for creating a second electromagnetic field comprises a conductor (3) adjacent the magnetic sensor (4).
- 20 5. A device (1) according to claim 1 or 2, the chip laying in a plane, wherein the means for creating a second electromagnetic field comprises two conductors (3), each of the conductors (3) being positioned adjacent one of two opposite sides of the magnetic sensor (4) at a same position with respect to the plane of the chip.
- 25 6. A device (1) according to any of claims 1 to 5, further comprising a first orienting magnetic field generator (6) external to the chip.
7. A device (1) according to any of the claims 1 to 5, wherein said chip furthermore comprises an on-chip first orienting magnetic field generator (6).



8. A device (1) according to claim 7, wherein said chip has two major surfaces opposite each other, the means for creating a second electromagnetic field and the magnetic sensor being located on a first major surface and the on-chip first orienting magnetic field generator (6) being positioned on the second major surface.
9. A device (1) according to any of claims 6 to 8, wherein said first orienting magnetic field generator (6) is a permanent magnet.
10. A device (1) according to any of claims 6 to 8, wherein said first orienting magnetic field generator (6) is an electromagnet.
11. A device (1) according to any of claims 2 to 10, wherein said magneto-resistance sensor (4) is a GMR sensor.
12. A device (1) according to any of claims 2 to 10, wherein said magneto-resistance sensor (4) is a TMR sensor.
13. A device (1) according to any of claims 2 to 10, wherein said magneto-resistance sensor (4) has an elongate strip geometry.
14. A device (1) according to any of claims 6 to 13, wherein the first orienting magnetic field generator (6) comprises means to vary a magnetic field strength.
15. A device (1) according to any of the previous claims, wherein said spin magnetic moments are nuclear spin magnetic moments.
16. A device (1) according to any of the previous claims, wherein said spin magnetic moments are electron spin magnetic moments.
17. A device (1) according to any of the previous claims, wherein said spin magnetic moments are coupled-spin magnetic moments.



18. A method for performing on-chip magnetic resonance measurements, the method comprising :
- orienting spin magnetic moments inside a sample (9) in a first orienting magnetic field,
  - 5 - exciting precession of said spin magnetic moments (11) inside said sample (9) to be analysed, and
  - on-chip detecting of spin magnetic moments precession by means of a magnetic sensor (4).
- 10 19. A method according to claim 18, wherein on-chip detecting of spin magnetic moments precession by means of a magnetic sensor (4) is performed by a magneto-resistance sensor.
- 15 20. A method according to claim 18 or 19, whereby generating the spin magnetic moments in the first magnetic field, is performed by the first magnetic field being generated external to the chip.
- 20 21. A method according to claim 18 or 19, whereby generating the first orienting magnetic field is performed by a magnetic field generator (6) integral with the chip.
22. A method according to any of claims 18 to 21, whereby exciting precession of spins (11) inside a sample (9) to be analysed is performed by generating a second magnetic field.
- 25 23. A method according to any of claims 18 to 21 whereby exciting precession of spins (11) inside a sample (9) to be analysed is performed by sweeping the second magnetic field over a frequency and/or amplitude range.
- 30 24. A method according to any of claims 18 to 23, furthermore comprising sweeping the first orienting magnetic field over a frequency and/or amplitude range.
25. A method according to any of claims 18 to 24, whereby said sample (9) comprises different types of magnetic particles or molecules.



26. A method according to claim 25, whereby said on-chip detecting of spin magnetic moments precession by means of a magnetic sensor (4) comprises detecting separate signals originating from different types of magnetic particles or molecules.
- 5 27. Use of the device as claimed in any of claims 1 to 17 for biological sample analysis or chemical sample analysis.